AMENDMENTS TO THE DRAWINGS

Please replace Figure 7 with the Replacement Figure 7, included herewith and labeled "Replacement Sheet."

REMARKS

STATUS OF THE CLAIMS

Claims 1-10, 12, 21-23, 43-45, and 48-53 were pending in this application. Claims 22 and 23 have been amended. Following entry of the amendments claims 1-10, 12, 21-23, 43-45, and 48-53 will be pending and at issue.

ALLOWABLE SUBJECT MATTER

Applicant acknowledges the Examiner's statement that claims 43-45 would be allowable if rewritten in independent form to include all of the limitations of the base claim and any intervening claims. Office Action, p. 10.

AMENDMENTS TO THE SPECIFICATION

The specification has been amended to include indication of trademarks with the symbol "TM" or "®," where appropriate and to capitalize the trademarks. The Applicant also notes that the trademarks used in the application are accompanied by the generic terminology where appropriate, as noted by the Examiner. Office Action, p. 3. No new matter has been added.

AMENDMENTS TO THE DRAWINGS

The Examiner objected to Figure 7, stating that the shading of the graphic in the Figure makes it illegible. Office Action, p. 2. Applicant has thus included a revised drawing sheet for Figure 7 labeled "Replacement Sheet," in which this shading has been removed. Approval of the Replacement Sheet of the drawing is respectfully requested.

IDS

Applicant notes with appreciation the Examiner's thorough consideration of the references cited in the IDS (Form 1449) submitted on December 6, 2001, including the French Patent No. 2693809 submitted previously. Office Action, pp. 2-3.

REJECTIONS UNDER 35 U.S.C. § 112, FIRST PARAGRAPH

Claim 23 was rejected under 35 U.S.C. § 112, first paragraph as allegedly containing subject matter which was not described in the specification in such a way as to enable one skilled

in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Office Action, p. 4. Examiner stated that Applicants' specification "merely refers to several methods for several recovery methods that are not well-known in the art (symmetric correlation, asymmetric correlation, etc.) without describing the methods." Without agreeing with the Examiner's rejection, but in the interest of further expediting prosecution, the Applicants have amended claim 23 to delete the terms referred to by the Examiner. Thus, Applicants respectfully request withdrawal of this ground of rejection.

REJECTIONS UNDER 35 U.S.C. § 112, SECOND PARAGRAPH

Claim 22 was rejected under 35 U.S.C. § 112, second paragraph as allegedly indefinite because it is "incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections." Office Action, p. 5. The Examiner further stated that "[n]o limitation shows how the original instruction code length calculation recited in the first limitation is related to the remainder of the invention." Without agreeing with the Examiner's rejection, but in the interest of further expediting prosecution, the Applicants have amended claim 22 to delete the calculating step referred to by the Examiner. Thus, Applicants respectfully request withdrawal of this ground of rejection

REJECTIONS UNDER 35 U.S.C. § 103

Claims 1-4, 6-10, 12, and 21-23 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over WIPO Patent Publication No. 99/01815 to Collberg et al. in view of U.S. Patent No. 6,829,710 to Venkatesan et al. Applicant traverses this ground of rejection.

Three requirements must be met for a prima facie case of obviousness. First, the prior art references must teach all the limitations of the claims. Second, there must be a motivation to modify the reference or combine the teachings to produce the claimed invention. Third, a reasonable expectation of success is required.

The cited prior art references do not teach all of the elements of the claims. The combination of Collberg and Venkatesan does not disclose the randomly generated, functionally

isomorphic code being "generated by random selection from a plurality of candidate codes," as recited in claims 1 and 10. The Examiner admitted that "Collberg does not disclose the random selection from a set of isomorphic codes." Office Action p. 6. However, the Examiner stated that "Venkatesan discloses the random selection of functions from a library in the process of protecting (watermarking by obfuscation) code." *Id.* The Applicants respectfully disagree and find that nowhere does Venkatesan discuss *random selection of functions* from a library. Rather Venkatesan "randomly selects *pairs of nodes*...and also inserts a pre-defined routine...from library 330" (emphasis added). Venkatesan, col. 7, lines 26-34. These pairs of nodes that appear on a flow graph created in Venkatesan correspond to regions of the target code where a pre-defined routine will be inserted. See *Id.* Thus, Venkatesan describes, at most, randomly selecting locations where a predefined routine can be inserted, not randomly selecting a routine to be inserted from a plurality of candidate routines. While the pre-defined routine is from a library, there is no random selection of it from that library. See *Id.* Thus, Venkatesan does not disclose *random selection of code* from a plurality of candidate codes, as recited in claims 1 and 10.

In addition, claims 1 and 10 recite a step of "scanning said compiled code for candidate instructions for substitution," and a step of "substituting randomly generated, functionally isomorphic code in place of said candidate instructions." The section of Collberg cited by the Examiner only discloses a technique of reordering the placement of items in the source application, but does not describe a step of scanning compiled code to find candidate instructions and then substituting the candidate instructions for randomly generated, functionally isomorphic code. The randomization in Collberg applies to *randomizing of placement* rather than the random generation of functionally isomorphic code described in the present application, which is substituted in for the candidate instructions. Similarly, the second section of Collberg cited by the Examiner (p. 68, line 14 to p. 69, line 9) only discloses randomization of the order of computations to be performed in obfuscation or randomizing the order of declarations used in the

source application. Venkatesan does not remedy this deficiency as Venkatesan also fails to disclose the scanning and substitution steps.

Similarly, Venkatesan does not disclose "substituting random context instruction codes for original CPU instructions in said compiled code" or "correlating said random context instruction codes to said original CPU instructions," as recited in claims 12, and 21, for at least the same reasons as stated above. In fact, Venkatesan does not disclose random context instruction codes at all, but at most discusses random selection of *pairs of nodes* in a flow graph. Again, the selection of the pre-defined routine to be inserted in the target program in Venkatesan is not random.

Accordingly, for at least the reasons stated above, the cited references do not teach all of the elements of claims 1 and 10. Claims 2-4 and 6-9 depend from claim 1 and incorporate all of the elements of claim 1, while claims 22-23 depend from claim 21 and incorporate all of the elements of claim 21. Thus, dependent claims 2-4, 6-9, and 22-23 cannot be rendered obvious by the cited combination at least for the reasons described above.

The cited art does not teach or provide a motivation to combine the teachings. The Examiner stated that "Collberg takes complied code and obfuscates...it in a random manner when possible." Office Action, p. 6. Venkatesan, however, does not disclose obfuscating the code of the target application. Venkatesan merely addresses the hiding of a watermark or subprogram within the target application so that the target application can be readily identified. There is no suggestion in Collberg to modify his obfuscation techniques to include a watermark in the target program for identification of the target program, nor is there any suggestion in Collberg to include a step of random selection of pairs of nodes in a flow graph. The Examiner must show "reasons that the skilled artisan, confronted with the same problem as the inventor, and with no knowledge of the claimed invention, would select the elements from the cited prior art reference for combination in the manner claimed." *In re Rouffet,* 47 USPQ2d at 1458, 1453 (Fed. Cir. 1998). Thus, the motivation to combine must be particularized, and the required

evidence cannot be substituted with a generalized scientific goal. Accordingly, the cited art does not teach or provide a motivation to combine the teachings, and thus the cited art cannot render obvious the claims.

Claims 1 and 5 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,696,822 to Nachenberg in view of U.S. Patent No. 6,829,710 to Venkatesan et al. Applicant traverses this ground of rejection.

The cited prior art references do not teach all of the elements of the claims. The combination of Nachenberg and Venkatesan does not disclose the randomly generated, functionally isomorphic code being "generated by random selection from a plurality of candidate codes," as recited in claim 1. The Examiner admitted that "Nachenberg does not disclose the random selection from a set of isomorphic codes." Office Action p. 7. However, the Examiner stated that "Venkatesan discloses the random selection of functions from a library in the process of protecting (watermarking by obfuscation) code." *Id.* As explained above, Venkatesan discloses random selection of *nodes* and not random selection of *functions* from a library, and thus Venkatesan does not disclose *random selection of code* from a plurality of candidate codes.

In addition, Nachenberg does not describe the step of "scanning said compiled code for substitution," as recited in claim 1. The Examiner pointed to a brief description in Nachenberg (col. 1, lines 11-17) of polymorphic viruses and generally how they work. Office Action at p. 7. Nachenberg simply refers to a mutation engine that "generates a virus decryption routine" and then "uses the dual of this routine to encrypt the static virus body and the mutation engine." Nachenberg, col. 1, lines 20-23. There is no explanation of how this encryption occurs. There are various mechanisms by which the polymorphic virus might work to generate the virus decryption routine, and thus one cannot assume that there would be any step involving scanning compiled code for specific candidate instructions to be substituted. Similarly, Nachenberg does not describe a step of substituting code in place of the candidate instructions for which the scanning was performed. Nachenberg only vaguely refers to some mutation strategies, but does not

actually describe the specific substitution step, as recited in claim 1, where randomly generated, functionally isomorphic code is substituted in place of the candidate instructions to generate a first code polymorph. Venkatesan does not remedy this deficiency, as explained above.

Accordingly, the Applicants respectfully submit that the combination of references cited fails to teach each and every element of claim 1. Since claim 5 depends from and incorporates all of the elements of claim 1, claim 5 also cannot be rendered obvious by the cited references.

The cited art does not teach or provide a motivation to combine the teachings. The Examiner states that "Nachenberg discloses that a polymorphic virus...provides each new file with a mutated (obfuscated) version of the virus, as this frustrates most standard virus-detection schemes." Office Action, p. 7. Again, Venkatesan, however, does not disclose obfuscating the code of the target application, but merely addresses the hiding of a watermark or other signature within the target application so that the target application can be readily identified. Accordingly, the cited art does not teach or provide a motivation to combine the teachings, and thus the cited art cannot render obvious the claims.

Claims 48, 49, and 51-53 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,006,328 to Drake further in view of U.S. Patent No. 6,829,710 to Venkatesan et al.

The cited prior art references do not teach all of the elements of the claims. The combination of Drake and Venkatesan does not disclose the randomly generated, functionally isomorphic code being "generated by random selection from a plurality of candidate codes," as recited in claims 48 and 53. The Examiner admitted that "Drake does not disclose the use of random algorithms." Office Action p. 8. However, the Examiner stated that "Venkatesan discloses the random selection of functions from a library in the process of protecting (watermarking by obfuscation) code." *Id.* As explained above, Venkatesan discloses random selection of *nodes* and not random selection of *functions* from a library, and thus Venkatesan does not disclose *random selection of code* from a plurality of candidate codes.

In addition, claims 48 and 53 recite a step of "substituting randomly generated, functionally isomorphic code in place of said candidate instructions." The Examiner stated that Drake discloses "insertion of obfuscating code, which is isomorphic, in appropriate places," and the Examiner noted that "[s]canning the code is necessary to determine such places." Office Action at p. 9. However, the section of Drake cited by the Examiner describes usage of "obfuscating inserts" and states that "[o]bfuscation is achieved by following unconditional jump instructions...with one or more dummy op-code bytes which will cause subsequent op-codes to be erroneously disassembled." Drake at col. 5, lines 42-54. Drake does not disclose substitution of candidate instructions for *randomly generated*, functionally isomorphic code. The section in Drake cited by the Examiner does not refer to any random generation of code. Venkatesan does not remedy this deficiency, as described above.

Accordingly, for at least the reasons stated above, the cited references do not teach all of the elements of claims 48 and 53, Claims 49, 51, and 52 depend from claim 48 and incorporate all of the elements of claim 48. Thus, claims 49, 51, and 52 cannot be rendered obvious by the cited combination at least for the reasons described above.

The cited art does not teach or provide a motivation to combine the teachings. The Examiner states that "Drake discloses the insertion of obfuscating code, which is isomorphic, in appropriate places." Office Action, p. 8. As described above, Venkatesan, however, does not disclose obfuscating the code of the target application, but merely addresses the hiding of a watermark or subprogram within the target application so that the target application can be readily identified. There is no suggestion in Drake to modify his obfuscation techniques to include a watermark in the target program for identification of the target program. Accordingly, the cited art does not teach or provide a motivation to combine the teachings, and thus the cited art cannot render obvious the claims.

Claim 50 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,006,328 to Drake in view of U.S. Patent No. 6,829,710 to Venkatesan et al. as

applied to claim 48 further in view of U.S. Patent No. 5,966,450 to Hosford et al. Applicant traverses this ground of rejection. Claim 50 depends from claim 48 and incorporates all of the elements of claim 48. Thus, claim 50 cannot be rendered obvious by the cited combination at least for the reasons described above regarding why claim 48 is not rendered obvious by Drake in view of Venkatesan. Hosford does not remedy the deficiencies of Drake and Venkatesan.

In conclusion, the cited references do not disclose all the limitations of the claims, and there is no motivation to combine the references as suggested by the Examiner. Accordingly, a *prima facie* case of obviousness has not been presented by the Office. Therefore, withdrawal of this ground of rejection of claims 1-10, 12, 21-23, and 48-53 is respectfully requested.

CONCLUSION

Withdrawal of the pending rejections and reconsideration of the claims are respectfully requested, and a notice of allowance is earnestly solicited. If the Examiner has any questions concerning this Response, the Examiner is invited to telephone Applicant's representative at (650) 335-7185.

Respectfully submitted,
DAVID TUCKER, ET AL.

Dated: 12/22/05

By: _____

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